6G and UN SDGs – Where is the connection?

5G Momentum event, 4th of February 2020

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University of Oulu

6G
FLAGSHIP
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INTRODUCING FINNISH
6G FLAGSHIP

6G

6G Flagship Vision Video for 2030:

https://www.youtube.com/watch?v=T6ubRoZCeVw

Vision for 2030

Our society is data-driven, enabled by near-instant, unlimited wireless connectivity.

6G will emerge around 2030 to satisfy the expectations not met with 5G, as well as, the new ones fusing AI inspired applications in every field of society with ubiquitous wireless connectivity.

2030

World's first 6G research program

6G Enabled Wireless Smart Society & Ecosystem

- National Flagship for **2018-2026**
- Volume **251 M€**
- Operated by **University of Oulu**
- Collaboration with **Nokia, VTT, Aalto University, BusinessOulu, OUAS.**

6G Flagship was elected as **Finland's high-tech Flagship,** by **Finnish Government** through **Academy of Finland**

FLAGSHIP
UNIVERSITY OF OULU
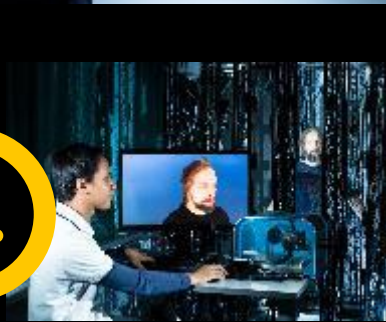
1. Wireless Connectivity

2. Devices & Circuits
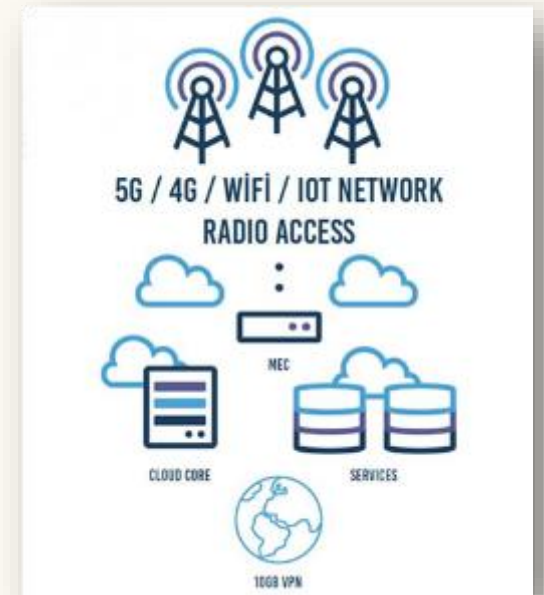
3. Distributed Computing

4. Services & Applications

6G Flagship Goals

- To support companies in **finalisation of the 5G** standard by carrying out technology and system pilots.

- To develop the **fundamental technology components to enable 6G** systems.

- To speed up **dependable, robust and secure digitalisation of society** via 5G and 6G.

KEY DRIVERS
AND RESEARCH
CHALLENGES
FOR 6G
UBIQUITOUS
WIRELESS
INTELLIGENCE

6G Research Visions 1
September 2019

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**WORLD'S FIRST 6G
WHITE PAPER**

Published on 9th of September 2019 as collaborative effort by 80 international experts
www.6gflagship/6gwhitepaper

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Drivers for 6G Research

SUSTAINABILITY GOALS

Quality Education • Clean Water and Sanitation
Gender Equality • No Poverty • Good Health and
Well-being • Climate Action • Sustainable Cities and
Communities • Peace, Justice, and Strong Institutions
Zero Hunger • Industry,
Innovation and Infrastructure • Reduced Inequalities
Responsible Consumption and Production • Decent
Work and Economic Growth

PRODUCTIVITY IN VERTICAL INDUSTRIES

Health • Manufacturing • Finance Technologies
Society 5.0 • Transport • Global Affordable
Coverage • Education • Agriculture • Energy
FinTech

SOCIETAL CHALLENGES

Education Innovations • Societal Services
Health and Wellbeing Services • Urbanisation vs.
Remote • Infrastructure • Work Life Change
Data Security and Privacy • Automation
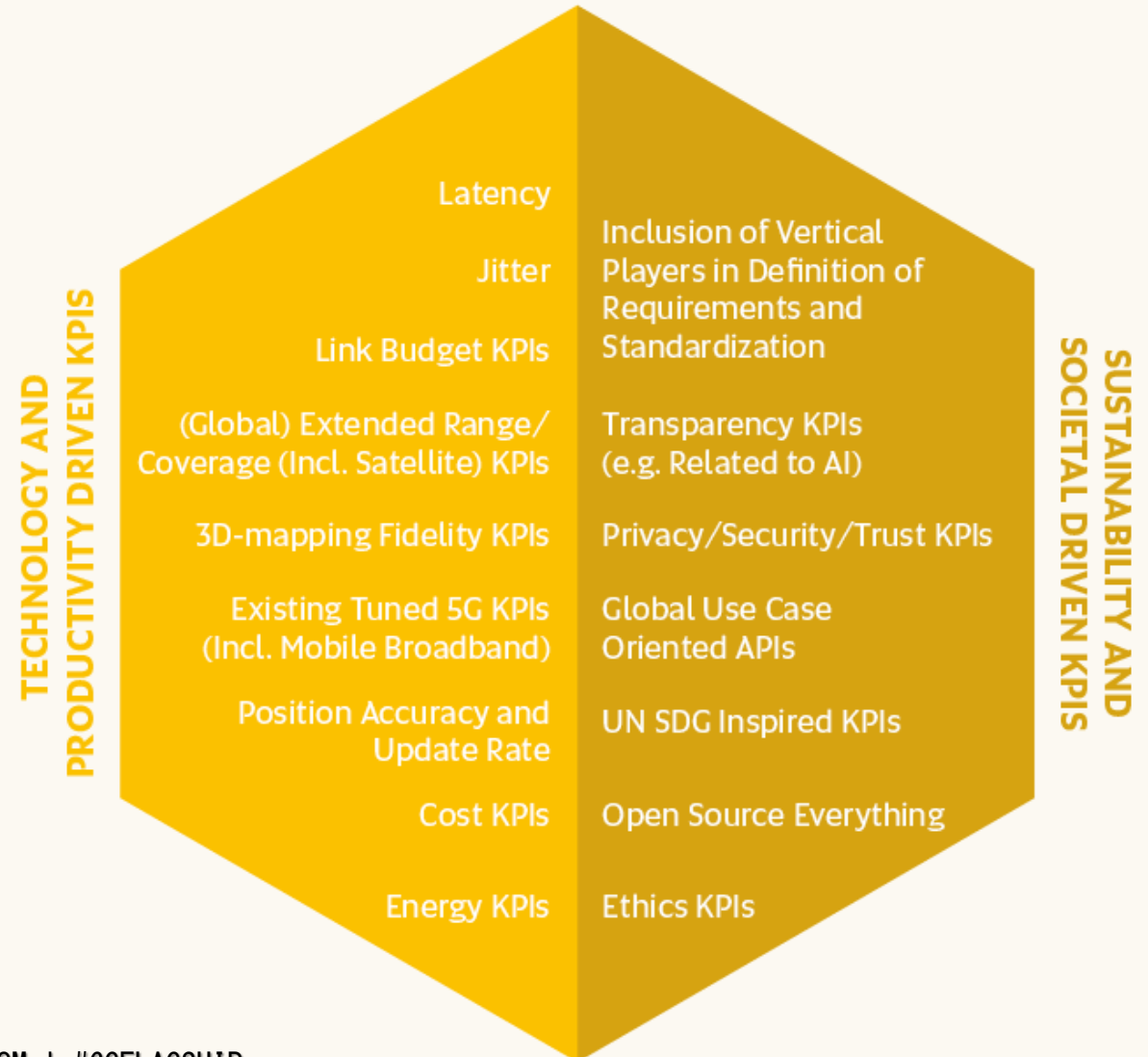Personalisation

TECHNOLOGY ENABLERS

Non-device Centric Communications
Accurate Positioning • Data Sharing
Novel Sensing • Small Data AI • Distributed Trust
Cyber-physical Security • Terahertz Technologies
4D-Imaging • Haptic Remote Telepresence
Photonic Signal Processing • Proactive Decision
Making • Pervasive User Identification
Zero-energy Communications • AI Inspired Air
Interfaces

Many of the KPIs used for 5G are valid also for 6G. However, the KPIs must be critically reviewed and new KPIs must be seriously considered.

TECHNOLOGY AND PRODUCTIVITY DRIVEN KPIS

Latency

Jitter

Link Budget KPIs

(Global) Extended Range/ Coverage (Incl. Satellite) KPIs

3D-mapping Fidelity KPIs

Existing Tuned 5G KPIs (Incl. Mobile Broadband)

Position Accuracy and Update Rate

Cost KPIs

Energy KPIs

SUSTAINABILITY AND SOCIETAL DRIVEN KPIS

Inclusion of Vertical Players in Definition of Requirements and Standardization

Transparency KPIs (e.g. Related to AI)

Privacy/Security/Trust KPIs

Global Use Case Oriented APIs

UN SDG Inspired KPIs

Open Source Everything

Ethics KPIs

INVITATION TO CONTRIBUTE TO 6G WHITE PAPER EXPERT GROUPS

We invite experts and enthusiasts of future 6G technologies to join the writing process of twelve themed 6G White Papers led by 6G Flagship senior researchers:

1. 6G Drivers and UN SDGs
2. Validation and Trials for Verticals
3. Machine Learning in Wireless Communications
4. Networking
5. Broadband Connectivity for 6G
6. RF & Spectrum
7. Connectivity for Remote Areas
8. Business of 6G
9. Edge Intelligence
10. Security and Privacy
11. Critical and Massive MTC towards 6G
12. Localization and Sensing

The 12 Expert Groups to be formed continue the work that started in the first 6G Wireless Summit in March 2019 and which resulted in the recently published 6G White Paper "Key Drivers and Research Challenges for 6G Ubiquitous Wireless Intelligence".

PARTICIPATION AND CONTRIBUTION

The new Expert Groups are formed based on an open call on 27 November 2019 - 6 January 2020.

Each Expert Group member can contribute to the group work in January-April 2020 in the form of e.g. novel ideas, illustrative graphics and active participation in discussions. Expert Group meetings are primarily organized via telcos and material can be co-written in a dedicated online space.

It is highly recommended that group members attend the 6G White Paper Workshop at the 2nd 6G Wireless Summit on 19 March 2020 in Levi, Finland to maximize the quality of the written outcomes - the themed 6G White Papers. If attendance in the workshop is not possible, considerable contributions made before and after the event remain valid.

6G WHITE PAPERS

The groups will produce 12 individual 6G White Papers that will be published in the 6G Research Visions -series of the University of Oulu with a specific DOI, ISBN number and online access through an open repository. All contributing Expert Group members will be included in the list of authors.

MORE INFORMATION

Website   www.6gsummit.com/
           program/6g-white-paper-workshop/
Twitter   @6Gflagship

New 6G White Paper work: 6G Drivers and UN SDGs

https://www.6gsummit.com/program/6g-white-paper-workshop/

Expert Groups:

1. 6G Drivers and UN SDGs
2. Validation and trials for verticals
3. ML in wireless communications
4. Networking
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White Paper on 6G Drivers and UN SDGs

- **Summary**
- **Introduction**
- **Megatrends – 6G drivers**
- **UN SDGs' linkage with mobile communications**
- **Indicators: Soft and hard KPIs**
- **Action plan: Future research topics**

Completion: 30th April 2020

Questionnaire

- **Questionnaire to collect ideas on the link between UN SDGs and mobile communications and potential KPIs:**
  - **Which of the UN SDGs would you connect with mobile communication and especially 6G?**
  - **Name five most important SDGs regarding 6G.**
  - **How can 6G help to achieve SDG1…17?**
  - **What kind of indicators would you use to measure how 6G has helped to achieve these goals?**

    https://link.webropolsurveys.com/S/6CEA77CD25DEBFF0

From SDGs to ICT related indicators

Goals / Targets:

4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women

9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020

17.6 Enhance North South, South South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism

17.8 Fully operationalize the technology bank and science, technology and innovation capacity building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology

SDG Indicators:

4a: Proportion of schools with access to the Internet for pedagogical purposes

4a: Proportion of schools with access to computers for pedagogical purposes

4.4: Proportion of youth/adults with ICT skills, by type of skills

5b: Proportion of individuals who own a mobile telephone, by sex

9.c: Percentage of the population covered by a mobile network, broken down by technology

17.6: Fixed Internet broadband subscriptions, broken down by speed

17.8: Proportion of individuals using the Internet

Mobile industry's contributions to SDGs

- **Deployment of infrastructure and networks: foundation for digital economy**

- **Access and connectivity: people can use mobile**

- **Enabling services and relevant content: Life-enhancing services for people**

Source: 2018 Mobile Industry Impact Report: Sustainable Development Goals. GSMA.

Conclusions

- **Research community needs to investigate how 6G could support in achieving the UN SDGs towards 2030.**

- **Proper connection between UN SDGs and 6G and KPIs need to be defined first.**

- **New White Paper work on-going – Join the work!**

THANK YOU!
QUESTIONS?

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